

thing then left, was to undertake to introduce medicines into the circulation, mechanically through the skin. The indications were to restore the circulation, relieve spasm, promote the action of the absorbents, and unlock the secretions. To effect these objects, we prepared the following mixture.

R. Strong mercurial ointment, 1℥.; powdered camphor, ½℥.; powdered Cayenne pepper, 4℥. Mix well together, and have the patient rubbed all over for half an hour at a time, and repeat the operation accordingly, till the mouth is affected. The success of this plan is perfectly astonishing. Without administering a particle of medicine internally, reaction is sure to follow in from one to three hours, even in the most perfect collapse; the secretions begin to return, the evacuations become bilious, and the patient expresses himself perfectly relieved. Since we began this plan, more than two-thirds of our patients have been cured—a large proportion of the rest were in a dying state when brought in. I believe the mercury is rubbed mechanically into the pores of the capillary vessels, and thus taken into the circulation. We invariably affect the mouth in from four to ten hours—then the patient is generally safe. We have lost but two where the gums were affected. In the course of my professional life, I have never been so gratified in the effect of remedial agents. The greatest sceptic in the usefulness of our science, would yield to the demonstration of such facts as our reports present.

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*Two Cases of Accidents, from Admission of Air into the Veins during Surgical Operations.* By JOHN C. WARREN, M. D. Professor of Anatomy and Surgery in Harvard University.—Some professional men have expressed doubts as to the accidental admission of air into the veins during surgical operations. Such doubts appeared well founded when the occurrence first attracted the attention of surgeons; especially on considering that veins about the neck were so very often wounded in the removal of tumours; and that some of them, as the external jugular, are frequently opened for the purpose of taking blood, without any unfavourable consequences.

Not long since I had evidence of the existence of such cases in two of my own patients within no great distance of time from each other. The certainty of such accidents and the possibility of their frequent occurrence, have led me to consider it a matter of duty to state them publicly, for the satisfaction and government of other surgeons. It seems to me remarkable, that nothing of the kind before occurred in my own practice, nor in that of my father and predecessor in a long and active surgical career.

CASE I.—Mr. William Burrill, of Salem, aged 60, was admitted into the Massachusetts General Hospital on the 16th Oct. 1830. He had a cancerous affection of the left side of the face and neck of the extent of three or four inches diameter. It was hard at the edges, of a livid red colour, ulcerated in the centre, very offensive, very painful, and had made an impression on the general health. The parotid gland, the submaxillary, the sublingual, and all the textures excepting the bone, were involved in the complaint. The lower jaw itself was thought to be diseased at first, but it afterwards appeared that it was not so. In so bad a state of things, I felt very little hope of being able to eradicate the disease, and would not have attempted any operation, had not the patient solicited it.

Considering the extent of the disease, that important blood-vessels would be divided, namely, the facial and sublingual arteries, probably the temporal and even the external carotid, I thought it best to begin by securing the carotid trunk. An incision for this purpose was begun opposite the thyroid cartilage and carried two inches downwards. The platysma muscle was divided; the edge of the mastoid exposed and dissected. Thus far, only a few drops of blood were discharged. The face of the sheath of the great vessels was a little uncovered, when a small effusion of venous blood appeared under the knife, and checked the operation. At that instant a very distinct sound was heard, like

the passage of air through water. A few bubbles were seen in the venous blood, the flow of which was immediately arrested by applying a finger on the part. The patient exclaimed, "I am faint." On regarding his countenance, it was not pale, but livid, almost black, and the muscles agitated by a convulsive motion. The respiration became deep, laboured, and stertorous like that of apoplexy. Committing the compression of the vein to Dr. Hayward, who assisted me, I examined the pulse at the wrist, found it distinct, but very slow. The wound not bleeding, and very little blood having been lost, I directly opened the temporal artery, and the blood poured from it with great freedom. As it flowed the respiration became more frequent and less laborious; the pulse at the wrist more natural. The leaden colour in the cheeks assumed a reddish tinge; and the alarming character of the symptoms was evidently diminished. About twenty minutes elapsed during these changes. At the end of half an hour I judged it safe to remove the patient to his bed, where he lay in a state of insensibility for two hours; at the expiration of which he awakened as from sleep, still breathing like an apoplectic. The night was passed without any accident, and on the following morning he was as well as usual, with the exception of a moderate soreness over the thorax, and a head-ache.

In seven days after the accident described above, the operation was performed without tying the carotid artery.

The diseased parts were included in an elliptical incision, extended from the lobe of the ear to the upper part of the neck, and including the submaxillary, the sublingual and parotid glands, all of them in a morbid and disorganized state. The os maxillare inferius was not diseased. The hæmorrhage was copious; but readily arrested, with the exception of that from a large vein, which from its depth, under the jaw, could not be distinguished so as to admit the application of a ligature, and was therefore compressed by a sponge. The veins below the wound were compressed by Dr. Hayward during this operation. The patient experienced a slight faintness, which soon passed off. He had no bad symptoms, and on the 10th of December the wound being nearly healed, he requested his discharge which was granted.

CASE II.—Nancy Bunker, of Trenton, in Maine, married, her age 33. Three years since she noticed a hardness in the right breast, which increased till it involved the whole gland in a tumour, very hard, moveable, yet obviously connected with the pectoral muscle by a morbid adhesion. The nipple is drawn in. The axilla is occupied by a considerable tumour of a globular form, and quite hard. The disease has been accompanied during the last year with very constant lancinating pains. The patient is desirous of an operation; has a strong conviction that she shall not recover; yet is perfectly tranquil and resigned.

On a careful examination of the tumour, it seemed that the whole of the diseased parts could be removed, and it being thought that the patient would thus have a chance for life, and that if the disease reappeared her sufferings would be less than if the gland were allowed to remain, the operation was performed on the 24th December, 1831.

The patient sat in a chair. The right arm was extended, raised above a horizontal line, in order to give tension to the skin, and permit access to the armpit—and was supported in this position by an assistant. The skin on the surface of the breast, with the diseased nipple, were included in an oval incision, the breast was dissected from the pectoral muscle and left connected with the axillary glands while the extirpation of these glands was effected. As they adhered to the great axillary vessels they were cautiously detached by dissection, and by insinuating the finger where the cellular substance was loose, between the tumour and the great vein. This separation was nearly effected—only a slight connexion still existing at either extremity of the tumour. Proceeding to separate it, at the outer part of the axilla, a vein was divided and a small quantity of venous blood discharged. This obscured the parts at that point, and the knife was therefore carried to the other extremity of the tumour. Scarcely was this done, when the patient struggled, and on regarding her I

perceived her complexion to be a livid pale colour, and at the same instant the bubbling or clucking noise was heard, though indistinctly, but the place from which it issued was not visible, the surrounding skin and fat having fallen over it, at the moment of the transfer of the knife. Directly, the axilla was compressed—the patient became insensible, breathing in a distressed manner as in apoplexy. The tumour was at once separated. The posture of the patient was changed, and she was supported by those around. Some brandy was poured down, and ammonia was introduced into the nostrils. The pulse however became less distinct every instant. Cloths dipped in hot water were thrown over the extremities. Strong frictions were applied to the chest and to all parts of the body. Considerable quantities of brandy were again poured down the throat. At this moment the livid colour of the cheeks gave place to a suffusion of vermilion red, and no glow in the cheek of a youthful beauty ever gave one so much pleasure as that flush. I was turning to the class, who watched the different operations with intense anxiety, to say, the “danger is over,” but checked myself and continued the efforts. But the flush soon passed off; the lividity reappeared; the respiration became more feeble; pulse at the wrist scarcely perceptible; and notwithstanding the redoubled applications of external heat and moisture, the extremities and the whole body cooled rapidly, and presently the respiration ceased.

As a last effort, I opened the larynx and put in operation the inflation of the lungs by a bellows, in a very speedy and perfect manner—imitating the movements of inspiration and expiration with great exactness—continuing the general application of heat and frictions to the whole surface. These administrations were continued for about twenty minutes longer, without any encouraging appearances. At the end of this time, I perceived there was no remaining hope of the restoration of my patient to life. The friends being anxious to take advantage of a vessel then sailing for their home, the body was soon after removed, and no opportunity afforded for examination.

The effects of the entrance of air into the blood-vessels appear to have been known to Lieutaud, Morgagni, and other distinguished pathologists; but the danger of such an occurrence in surgical operations does not seem to have been adverted to, until the operation of M. Dupuytren, in which the admission of air through the external jugular proved suddenly fatal. Since the publication of this fact, the occurrence has presented itself to many surgeons in Great Britain and this country.

A natural scepticism in regard to these accidents has arisen from not considering the peculiar action of the auricles of the heart. How, it is asked, can air force itself into the veins, which are already filled with blood, and at the moment this fluid is discharging itself from an aperture in the vessel? The possibility of the accident will however be admitted, on recollecting that the auricles act not only like an expelling syringe, when they drive the blood into the ventricles, but that they have the power of suction, when they dilate themselves, thus sucking the blood from the two cavæ, and of consequence from the great veins connected with the cavæ. This suction power of the auricles explains what would otherwise be unintelligible, the movement of blood through the large inactive veins near the heart.

There remains another difficulty. Why do not the sides of these veins collapse when the blood is pumped from them by the auricle? and if they do thus collapse how can air be drawn in through a small aperture in one of these vessels? This objection has been removed by M. Bérard, who has shown that the large veins near the heart are protected by fasciæ, connected to the coats of the veins by cellular substance. The fasciæ themselves are attached to bones, in such way as to prevent their collapsing on the veins. Further, it may sometimes happen that the coats of a vein assume a morbid structure which gives them an unhealthy rigidity, and in this manner prevents their collapse. This occurred to M. Dupuytren, as I am informed by my friend Dr. Lodge, who was

in Paris at the time. M. Dupuytren, being about to divide a large varicose saphena vein, expressed some apprehension that air might be admitted and that the result would be fatal. The vein was divided, the peculiar sound of the entrance of air was heard, and the patient expired.

In the first of the cases above related, the vein opened was a small vein crossing the neck from the median external jugular to the great internal jugular. At least I presume this to have been the vessel; though there can be no certainty of its identity, the incision in the neck being small; the parts not much uncovered, and the sheath of the internal jugular not opened. This small vein, stretched across the neck, was kept tense by its attachment to fixed veins at each extremity, and would thus be in a favourable position for the admission of air on the suction of the auricle.

The vein opened in the second case was the subscapular. It did not seem to be large, though perfectly visible before it was cut—and the point of the incision was at a sensible distance from the great axillary vein—say nearly an inch. The dissection had separated it from the surrounding parts in a considerable degree. The axillary cavity was extensively dissected; so that the attachments of the fasciæ covering the great vein must have been much relaxed.

Here then was a small vein, at some distance from the heart, dissected from the surrounding parts; and its receiving vein also dissected. The coats of the vein were not visibly diseased. The explanations of M. Bérard will not therefore apply. The cause of the phenomenon in this case is to be sought in the position of the arm. The limb was extended and elevated; in consequence of which, the axillary vein was in a state of extreme tension. The subscapular vein was also kept tense by the chain of axillary glands and by the weight of the depending breast; for this organ had not been separated from the glands, in order that they might be drawn down by it and exposed.

The possibility of these accidents under circumstances like those above, where there could be so little reason to fear them, must be a cause of anxiety to operators, in the removal of tumours from the neck and arm-pit; and I know of no effectual means to guard against them. Pressure on the vessels intervening between the disease and the heart would often be impracticable; and where it could be applied, the tension of the fasciæ would generally render it abortive. Causing the patient to expire the air from the lungs could only be practised for a moment. *Change of position*, by relaxing the vessels, would do something; yet the state of tension must in many cases be resumed, in order to carry on the operation. The immediate compression of the vessel on the appearance of the accident, might sometimes save the patient from death, though not from very threatening appearances. For in the first case the patient's life was preserved; but although the accident was instantaneously arrested, he was saved with difficulty.

On a view of all these considerations, it appears prudent to suspend an operation in the vicinity of the heart, at the instant of appearance of venous blood from a suspicious point; and to compress the vessel, that time may be had for observing whether dangerous symptoms are likely to arise, and if these actually appear, we should directly resort to the means spoken of. First, compress the orifice of the bleeding vein with the utmost care. Second, apply pressure on the veins between the wound and the heart. Third, relax the part in which the vein is seated. Fourth, the patient may be directed to expire the air from his lungs.

The means to be pursued for saving life, after air has been admitted, have been stated in the history of these two cases, and I know of none more effectual than were adopted. The opening of the temporal artery gave great relief to Case I. It was not resorted to in Case II., because the patient had already lost as much blood as she could spare, during the operation.